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no.77-20

Forest Insect and Disease Management

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BIOLOGICAL
EVALUATION R2-77-20

WESTERN TENT CATERPILLAR

Pagosa Ranger District
San Juan National Forest

DECEMBER 1977

Rocky Mountain Region

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PREPARED BY:

James P. Linnane
Entomologist

APPROVED BY:

G. L. DOWNING
Staff Director
Forest Insect and Disease Management

F. A. DORRELL
Deputy Regional Forester
State and Private Forestry

Forest Insect and Disease Management
State and Private Forestry
Rocky Mountain Region
USDA Forest Service
11177 W. 8th Avenue
Lakewood, Colorado 80225

INTRODUCTION

The western tent caterpillar can be a serious defoliator of broadleaf trees and shrubs in the central and southern Rocky Mountains. Quaking aspen is its principle host above 8,000 feet. Currently in southern Colorado, tent caterpillar numbers appear to be increasing, causing widespread and sometimes severe defoliation of aspen, including commercial quality aspen.

During June and July of 1977, the western tent caterpillar defoliated approximately 7,500 acres aspen on the Pagosa District of the San Juan National Forest. During December of 1977, Jim Linnane and Kent Eggleston of the Forest Insect and Disease Mangement Staff Unit evaluated tent caterpillar populations on the Pagosa District.

The summer of 1977 was the first year of highly visible tent caterpillar damage on the Pagosa District. The outlook for 1978 is a continuation of heavy tent caterpillar induced defoliation of aspen on the district.

TECHNICAL INFORMATION

CAUSAL AGENT: *Malacosoma californicum* (Packard); the western tent caterpillar

HOST AFFECTED: *Populus tremuloides* Michx.; quaking aspen

CAUSAL AGENT BIOLOGY: The western tent caterpillar has one generation annually. In aspen stands, adult moths may be found from mid-July to early August. Adults mate shortly after emergence. Females usually deposit one egg mass on small twigs and branches in the upper third of the crown. Embryonic development is completed within four weeks. The insect overwinters as a completely developed first stage larva within the egg. Larvae emerge in the spring about the same time as aspen bud burst. Young larvae feed gregariously.

Larvae from the same egg mass or a nearby egg mass construct a silken tent in a branch crotch. The tent serves as a resting place, a molting site, and for protection during unfavorable climatic conditions. Larvae undergo five molts and mature in 30 to 42 days. Older larvae lose their gregarious behavior and wander over the host, adjacent vegetation, or the ground seeking additional food or pupation sites. Larvae spin individual silken coccoons in which they pupate. Moths emerge in 12 to 18 days.

EXTENT OF THE OUTBREAK: The tent caterpillar infestation extends from just north and west of V-Rock southeasterly to Price Lakes on the Pagosa District, southwest of Pagosa Springs (Figure 1). The current infestation covers approximately 7,500 acres.

HOST STAND CONDITION: The infestation area is comprised of pure aspen and aspen-white fir forest types. Highly visible defoliation was first reported in 1977. Damage at this stage of infestation does not appear serious. However, several authors (Churchill et. al. 1964; Duncan et. al. 1956; Rose 1958; and Stelzer 1968) have reported severe defoliation greatly reduced aspen radial growth and increased the incidence of secondary insects and diseases in the Lake States. Stelzer (1968) indicated repeated defoliation over consecutive years significantly increased top-kill, tree mortality, and greatly reduced the "biological, economic, and esthetic value" of aspen stands.

EVALUATION METHODS

Defoliation predictions for 1978 were based on the results of an egg mass survey. The egg mass sampling scheme followed that of Stelzer (1968). Sampling was restricted to aspen only. Two, 30 inch branches were pruned from the upper crown of each sample tree. The average number of new egg masses per two branch samples was computed. Sample trees were located along transect lines within the areas illustrated in Figure 1. A minimum of 20 trees were sampled in each area. Defoliation predictions were based on guidelines determined by the Region 3 FI&DM office.1/

1/ Personal communication with Region 3 FI&DM office.

In addition to sampling along transect lines, five plots were established within the infestation zone. In successive years, the average number of new egg masses per two branch samples and the degree of defoliation sustained by individual sample trees will be correlated. The information obtained will hopefully improve the accuracy of defoliation predictions. The plots will also serve to accumulate additional information on the effects of defoliation on aspen, including: loss of growth, tree mortality, incidence of secondary insect and disease activity.

RESULTS AND DISCUSSION

Results of the egg mass survey are presented in Table 1. Samples in vicinity of V-Rock produced an average of over five new egg masses per two branch samples. This indicates heavy defoliation (tree completely stripped) can be expected on the V-Rock area during 1978. The Price Lakes samples averaged 3.7 new egg masses per two branch samples, again indicating heavy defoliation during 1978. The outlook for the entire infestation zone, based strictly on an egg mass survey, is heavy defoliation during 1978.

Historically, tent caterpillar populations have been subject to broad fluctuations in numbers. The current infestation on the Pagosa District appears to have exploded from endemic to epidemic levels in one season. Conversely, tent caterpillar populations may drop from epidemic to endemic in an equally short time. Natural agents, particularly viral disease, and starvation may be responsible for a rapid decline in population.

The parasite, predator, and disease components of the current tent caterpillar epidemic on the Pagosa District have not yet been fully evaluated. A sample of the egg masses collected during the recent survey will be reared in the laboratory to determine the incidence of viral disease. Estimates of parasitism, field observations on predators, and observations on the occurrence of disease will be made during 1978. A follow-up evaluation in the fall of 1978 will include the results of laboratory rearing, parasitism rates, and field observations on predators and disease, as well as a prediction of defoliation for 1979.

RECOMMENDATIONS

The recent conversion of the majority of the tent caterpillar infested areas into roadless classification prohibits any direct chemical control or silvicultural approaches to curbing the infestation. However, FI&DM will continue to monitor the progress of the infestation.

REFERENCES

Churchill, G. B. et. al. 1964. Long-term effects of defoliation of aspen by the forest tent caterpillar. Ecology 45(3): 630-633.

Duncan, D. P. et. al. 1956. Influence of the forest tent caterpillar upon aspen forests of Minnesota. Office of Iron Range Resources and Rehabilitation. St. Paul, Minnesota, 45 pp.

Rose, A. H. 1958. The effect of defoliation on foliage production and radial growth of quaking aspen. For. Science: 4(4): 335-342.

Stelzer, J. J. 1968. The great basin tent caterpillar in New Mexico: life history, parasites, disease, and defoliation. USDA Forest Service, Research Paper RM-39, Rocky Mountain Forest and Range Experiment Station, 16 pp.

Table 1 - Results of a Western Tent Caterpillar Egg Mass Survey on the Pagosa District, San Juan National Forest

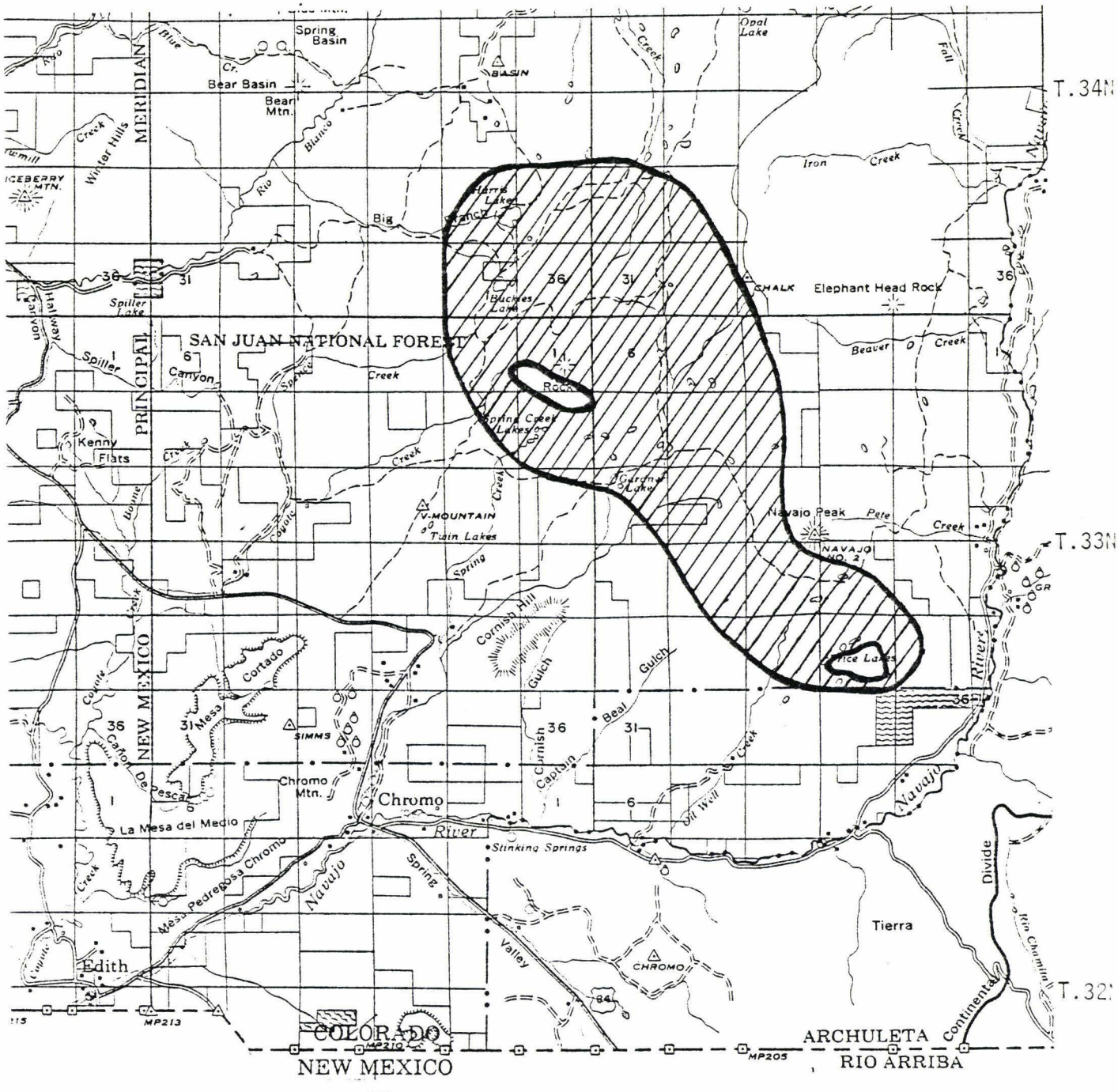
Sampling Vicinity	No. Sample Trees	Aver. No. New Egg Masses/two 30-inch Branches	Defoliation Prediction
V-Rock	40	5.4	Heavy
Price Lakes	25	3.7	Heavy

Class Limits for Defoliation Predictions [1]

Aver. No. New Egg Masses/two 30-inch Branches[2]	Defoliation Prediction
1.2 or less	Light - feeding damage confined to upper crown
1.2 to 2.5	Medium - trees with upper crown stripped of foliage; midcrown thin
2.5 or more	Heavy - trees completely stripped of foliage or nearly so

[1] Based on information provided by the R-3 FI&DM office

[2] Based on a minimum of 20 sample trees



Approx. Area of Current Infestation

Area Actually Sampled

Scale ½" = 1 mile

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Figure 1. Western tent caterpillar infestation on the Pagosa District, San Juan N.F.